# Low Cost, Low Temperature Processing, High Use Temperature Composite Material



The official link for this solicitation is:
[http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml](http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml)

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Description:
There is an emphasis on lightweight systems; however, many armament systems have use-temperatures that exceed traditional organic, composite systems. Specialty polymers can extend the range to 700F, but are expensive and hard to process. High-use temperature composites include pre-ceramic polymers, ceramic matrix and metal matrix composites. All of these are expensive and hard to process. This effort focuses on developing a composite system which is low cost and can be processed at low temperatures while still having a high-use temperature. The processing temperature must be low enough so as to not cause coefficient of thermal expansion mismatch issues with steel substrates. PHASE I: Develop a composite material system that demonstrates low cost, low processing temperature and high-use temperature. Demonstrate its capabilities by producing mechanical test results across the entire temperature range of interest. ASTM D3039 (Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials), D3410 (Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading), D2344 (standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates), and either D3518 (Standard Test Method for In-Plane Shear Response of Polymer Matrix Composite Materials by Tensile Test of a +/- 45° Laminate) or D5379 (Standard Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method) should be used to generate these properties. If a novel material that is not a polymer matrix composite is developed, then appropriate test standards may be substituted.

The material deliverable shall be 25 lbs of developed material in a continuous fiber form that can be processed on existing filament winding or tape placement equipment. The use-temperature must range from -70F to at least 800F, preferably 1000 F. The material should be physically and environmentally stable across the entire temperature range. Cost of the system should be same or lower than standard temperature thermoset materials. PHASE II: Refine the material system and demonstrate high temperature stability by testing material samples at elevated temperatures. Property goals at room temperature in the fiber direction shall be a tensile strength of 200 ksi, a tensile modulus of 25 Msi, a compressive strength of 100 ksi, and a compressive modulus of 20 MSI. The interlaminar shear strength shall be equal to or greater than 9 ksi and any deviation from this value shall be reported and a plan to achieve 9 ksi shall be described. Shear modulus and strength, along with transverse properties, shall be measured as well. At 800F, properties in all directions shall not decrease by more than 20%. PHASE III: Finalize the development of a material based solution that can be readily implemented on existing manufacturing equipment. Non-DoD applications include down well piping, engine components, etc.